The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

BOUVERIE HOUSE, 154 FLEET STREET, LONDON, E.C.4

Telegrams: ALLANGAS FLEET LONDON
Telephone: CENTRAL 3212 (10 lines)
GLASGOW: 116, Hope Street (Central 3970)
BIRMINGHAM: Daimler House, Paradise Street (Midland 0784-5)
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The Control of Industry

INDUSTRIALISTS are so busy at the moment with the manufacture of war material that they have not always time to look far ahead into the post-war position. When they are able to do so they are not altogether reassured by the picture that presents itself. It is admitted that the condition of the world in the 1920's and early 1930's was chaotic. International business was limited and difficult. This difficulty, one feels, did not arise from defects in business administration, but from political repercussions of the several efforts of the Governments to establish themselves and to cure unemployment on the national, rather than on the international, scale. Politicians are now looking forward to some form of political post-war action that will break down the dams holding up the volume of international trade which would undoubtedly flow if it were given the opportunity. Hr. Tryggve Lie, the Norwegian Foreign Minister, has recently said: "The details of future economic co-operation must be governed by certain simple facts. One is that political stability is impossible without international economic collaboration; and the other is that the world will certainly not return to the old liberal economic system. The war has made necessary in all countries a national planned economy under the direction of the State; and in the years immediately following we shall be faced with tremendous tasks of economic reconstruction. The first will be to supply the whole European continent with consumption goods for which there will be an urgent need; the next to supply them with the means of production, to make it possible to start the wheels turning again."

This is a fair sample of the way in which statesmen are looking at post-war problems. It will be noticed that Hr. Lie envisages "a national planned economy under the direction of the State." He suggests later in the same article that this planned economy is the first step towards an international planned economy, "and afterwards will come the regulation of markets and common plans for opening up new markets." This is all very well as far as it goes, but to many it appears to go too far. We stand at the parting of the ways. Up to 1914 businesses were left severely to the control of their managements subject to compliance with the fundamental laws of the land. Lord Perry has pointed out that the industrial revolution made it possible for any man to work his own way from poverty and illiteracy to a commanding position in both industry and the State. Richard Cobden is an outstanding example—the son of a Sussex farm labourer who became a great Lancashire manufacturer and a great statesman. William Cobbett is another example. In fact, industry and commerce during the 19th century produced such men not by the hundred, but by the thousand—careful, frugal men, hard of head and often hard of heart, but notable for two qualities above all others, diligence and self-reliance.

These men were self-trained into habits of clear commercial thinking, quick and bold decision, personal responsibility and individual initiative. It was no easy school. Those who lacked the necessary application or the necessary drive had short shrift. The age was kindly only to those who satisfied its needs. Great risks had to be taken. In order to induce men to take those risks, the reward of success was great. Under this system the nation flourished exceedingly.

To-day we are ruled by the Bureaucracy. The system appeared to reach its height after the last war when the Government had taken control of many industries and left them bankrupt. Since then Parliament has made laws—in the opinion of many far more laws than are necessary—and has placed them on the Statute Book as general principles only, the details being left to the Minister responsible, advised by his Civil Servants. Under these conditions, again quoting Lord Perry, "the difficult and skilled work of conducting specialist businesses and industrial processes has been handed over to the control of untrained and inexperienced amateurs of a Government Department." This is a trend which must be carefully watched. The national experience of Government control of industry is far from reassuring. Only those who have spent their lives acquiring the technical and commercial details of a particular trade are qualified to direct that trade.

If greater organisation of industry than can be effected by voluntary means proves necessary, the control should be supervised by the industry itself and not by amateurs. This is no reflection on the Civil Service, individually or collectively; so far as industrial matters are concerned they are amateurs and should be regarded as such. The Board of Trade has recently taken a step that seems hopeful. The Department in the Board which is concerned with the affairs of the gas industry has just been reorganised, and has been put under the control of Dr. E. W. Smith and a staff of high officials of whom only one is a permanent Civil Servant, and of whom all have had a lifelong experience of the methods of the industry. If this method were to be generally adopted industry would regard Government control with a great deal less alarm. It may be necessary for Governments to take action in regard to tariffs and to the international organisation of trade. If properly advised, that is part of the functions of modern government. The control of industry within the country, however, should be left in the hands of industry.

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NOTES AND COMMENTS

Fuel in Industry

INDUSTRIAL chemists will have noted with satisfaction the commendable co-operation between gas and electricity undertakings in the matter of bringing home to the public the urgent necessity of economising fuel, so that a greater volume can go to factories engaged in vital war work. At the same time it is obvious that much more could be done in obtaining the best possible use of fuel, particularly in industry, and it is therefore gratifying to learn that under the ægis of the Institute of Fuel there is to be an even wider degree of co-operation in this direction. At the request of the Mines Department, a series of meetings has been arranged with the object of inaugurating an open discussion on the best ways and means of improving the efficient use of fuel and power in industrial plants under present conditions and to invite constructive suggestions. The meetings are being arranged by no fewer than ten of the leading technical bodies—the Institution of Chemical Engineers, the Institute of Chemistry, the Society of Chemical Industry, the Institute of Fuel, the Iron and Steel Institute, the Institution of Civil Engineers, the Institution of Mechanical Engineers, the Institution of Mining Engineers, the Institution of Gas Engineers, and the Institution of Electrical Engineers. With this influential backing, the meetings should be fruitful of beneficial results, especially as they are being held in different parts of the country, thus ensuring a representative expression of opinion. The first, as announced on p. 301, will be at Manchester on December 16; the second at Bristol on January 3; and the concluding meeting in London on January 8. This last meeting will be preceded by a luncheon at the Waldorf Hotel, at which the Secretary for Mines, Mr. David Grenfell, will take the chair.

Empire Industrial Envoys

THE explosion of war in the Pacific has brought three great Dominions—Canada, Australia, and New Zealand—into the front line, and has drawn urgent and renewed attention to the need for co-ordinating war production throughout the Empire. An editorial note in *Canadian Chemistry and Process Industries* justly points out the difficulties that beset certain war industries in the Dominions, while not affecting similar activities in Great Britain or the United States to an equal degree. The reasonable and very mild complaint is made that "the number of persons in Great Britain who know Dominion industries well is not great." We should have put it much more strongly than that, but recriminations are a waste of time at the moment; it is far better to seek a remedy. The note goes on to say that our principal travellers even nowadays are not engineers, although recently they have been given a better chance to get about (subject, of course, to the allotment of places in priority planes to cinema stars and three-year-old infants). The circulation throughout the Empire of chemical engineers and working industrial chemists, with authority to make the necessary recommendations, would be an excellent lubricant to the wheels of industry. Canada, for example, has still an enormous reservoir of skilled labour waiting for instructions on how to employ their skill to the best purpose. Masses of official publicity urge them in a general way to get on with the war effort; but a few more specific instructions to engineers and industrialists would be far more effective. Let the production departments of the Government, therefore, send out their ambassadors with full credentials to co-ordinate the vast number of relatively small unit factories throughout the Empire. Thus and thus only shall we attain the speed of production needful at this new crisis of the war.

Paper for Victory

ALL our readers will by now have become as painfully aware as are publishers of the supreme need to save paper. If spasmodic and reiterated appeals for salvage had failed to do so, the drastic regulations of the recent Control of Paper (No. 36) Order will have succeeded. Scarcely anything may be labelled or wrapped, and what had been a peculiar war-time problem of the newspaper and periodical proprietor has now become everybody's business. Paper is wanted for victory. It must have been a revelation to many that so much paper entered into the actual manufacturing processes of the weapons of war. Plain duty and vital need now demand that all should produce the greatest possible tonnage of "waste." We suggest that readers may well make a virtue of necessity. Here, surely, is the golden opportunity to have that long-dreaded, but too frequently postponed clearance of old business books and documents, out-of-date lists and catalogues, ancient reference works long disused, except as sinecure occupants of valuable shelving and collectors of dust better gathered by the cleaner. Two City firms—and not the biggest—alone produced ten tons in a week's effort, and both are none the worse for it—the office air is, indeed, all the clearer. The waste paper drive demands the backing of all. It gives plenty of scope for ruthless energy without hurting a soul and to the better advantage of the Allied cause. One word from the man at the head of affairs in any business can set it in profitable motion.

Oxygen Gauges

Safety Designs for Laboratories

THE recent failure of an oxygen gauge at the U.S. National Bureau of Standards, resulting in injury to a member of the staff, calls attention to a hazard which probably exists in various laboratories. Gauges used on oxygen tanks are liable to two sorts of explosion: simple mechanical breakage under pressure of the Bourdon tube within the gauge; and actual explosion due to ignition of oxygen-oil mixtures within the gauge tube. The older small-type gauges do not adequately protect the user from the results of breakage or explosion. In general the fronts of the gauges are liable to fly off, with hazards of glass or other mechanical injury. Newer gauges are designed to avoid this danger, and most of the gauges purchased in the past few years have this provision.

The hazard of the old gauges still in use appears sufficient to warrant their being discarded and replaced by gauges of the newer protected design. There are two designs of the latter nature that have been approved by the Underwriters' Laboratories. The better of these is known as the "safety-back" design in which the back plate will open in case of excess pressure but is prevented from being thrown off so as to be a source of hazard.

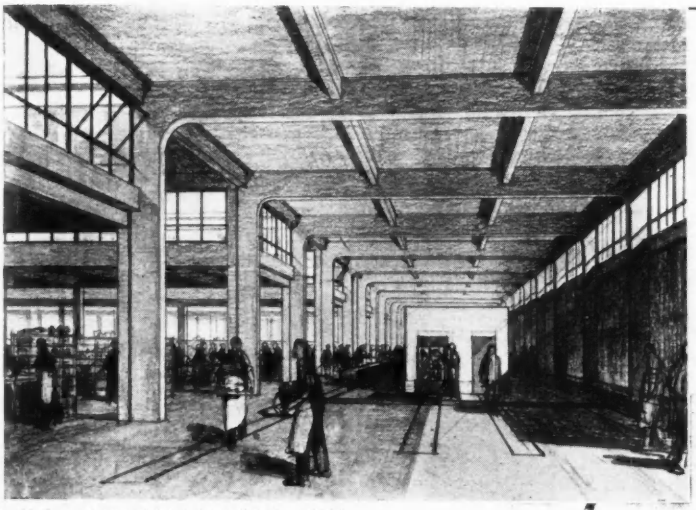
In view of the hazards involved, all small gauges (3 inches or less) used on high-pressure oxygen should be examined as to their age and design, and replaced by new safety-back gauges if they are not provided with this feature. It is emphasised that *all* gauges used with high-pressure oxygen should bear the following warning in a conspicuous place: "*Oxygen—Use No Oil.*"

CERAMIC CHEMISTRY

I.—Glazing and Decoration

by

A. BERNARD HOLLOWOOD, M.Sc.



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The old and the new in pottery works: above, an interior view of the new Wedgwood factory at Barlaston, showing a tunnel kiln; on the right, the original works at Etruria, seen from the packing-house

ONLY in recent years has the pottery industry received the serious attention of Science. Traditionally a craft industry potting had remained largely undeveloped from the time of Josiah Wedgwood. It is true that that master potter, through his indefatigable research, provided adequate material on which to build an industry and that his "recipes" were good enough for generations, but the severity of international trading competition within the last fifty years has made scientific progress imperative.

Furthermore, a factor that has long hindered the development of the industry has lost its significance. The small firm has been characteristic of pottery production for generations and small firms are without the resources to facilitate research. With the growth of newer branches of the industry such as those dealing in glazed tiles, sanitary ware, and electrical porcelain came the larger unit and rationalised planning. The older domestic tableware producers have profited by this example. Co-operative research stations have been set up and great advances have been made in several branches of the industry. The larger unit will soon be representative, for the exigencies of war have caused the "telescoping" of production. Typical of the new movement is the migration of the Wedgwood business from Etruria to Barlaston. The new works is electrically operated and smokeless and presents an amazing contrast to the old patchwork factories surrounded by their smoking bottle-neck ovens. In this revolution the ceramic chemist has played an important part, but there are many problems awaiting solution.

Recent broadcast talks to housewives have indicated some of the defects inherent in all pottery to some degree, and in bad pottery to an extent that renders it unhygienic, unlovely, and weak. The ordinary pottery body consisting of (say) 35 per cent. calcined flint, 30 per cent. ball clay, 20 per cent. china clay, and 15 per cent. Cornish stone is normally one of the toughest and most durable materials known to science. Witness the remarkable preservation of pieces which have been buried in earth or water for centuries. Yet this same body and its glaze may be ruined by careless treatment in the kitchen. It is known that food remains, mustard, salts, gravy, fruit juices, etc., can have a ruinous effect on pottery glazes and decorations if they are allowed to remain in action long enough. Washing-soda is the arch enemy of domestic pottery; it acts quickly enough to ruin the finest wares.

When it is recalled that pottery is also liable to crazing, blistering, and dulling, it will be seen that opportunities for research in ceramic chemistry are numerous. Even vitreous bodies are porous to some degree. Langenbeck estimated that an ordinary fired earthenware body could absorb up to one-fifth of its volume of liquid. This porosity makes essential the coating of the ware with a non-porous film of glass. If this is removed by chemical action, by crazing, or by chipping, the utensil becomes unhygienic; it absorbs part of each successive content and may well become poisonous. The earliest method of glazing practised in Britain was by applying powdered lead ore to the surface of the ware, a dangerous procedure. This method was superseded in the 16th century by salt glazing. Common salt was thrown into the oven during the period of maximum heat, vaporising and decomposing (on coming into contact with the water vapour of the furnace gases) to produce hydrochloric acid and sodium oxide. The combination of sodium oxide and the earthenware silicates formed a double silicate, a refractory glass. For domestic earthenware salt glazing has gone out of fashion, as being somewhat harsh to cutlery and lacking utilitarian smoothness. The method is still used, however, for cruder types of pottery such as drain pipes, jam jars, and mouldings. It is cheap and highly resistant.

Modern glazes are applied in liquid form to the biscuit ware, fritted glazes being most commonly used. The soluble ingredients, borax, soda ash, etc., are prepared in a sintered or fritted mass to form an insoluble frit which is usually mixed with one or more insoluble components to form the final glaze. If the glazing substance consists only of fritted materials it may suspend badly in solution and tends to dust off the treated biscuit ware. A good glaze must withstand the high temperatures of the glost oven (1000° C.) without devitrification, and should be sufficiently tenacious when melted to avoid running off upright surfaces. It must not affect the chemical stability of colour

patterns printed or painted under or on the glaze. Above all it must possess the same coefficient of expansion as the body of the ware. If during subsequent heating in service the mutual adhesion between body and glaze is destroyed through differential expansion the ware will become crazed. It is true that crazing is a fault seldom encountered in good pottery, but it is common enough in the cheaper stuff. Early Oriental potters were unable to remedy this defect in their wares and, with typical astuteness, turned the phenomenon into a decorative device. Their "crackle" wares were adorned by a network of tracery, an effect obtained by rubbing lamp-black, vermilion, cobalt blue, or some other colouring material into the cracks. Modern potters can do better than this, for they can control the degree of crazing by variations in the composition of the glaze. For example, in a glaze containing whiting, Cornish stone, flint, borax, nitre, and china clay, it is possible to reduce the number of cracks per unit of area by the gradual substitution of whiting for borax.

In an ordinary earthenware, crazing is remedied by altering the composition of either glaze or body to equate their coefficients of expansion. That of the body, may be raised by adding more malleable clay for china clay or by increasing the silica content at the expense of the clays. To reduce it, these modifications are reversed.

Another serious defect, which manifests itself in the form of bubbles in the glaze, is caused by impurities, such as sulphates and chlorine compounds, in the glazing solution. At high temperatures the sulphates are decomposed by silica and are partially transformed into acid salts, which release surplus sulphur trioxide.

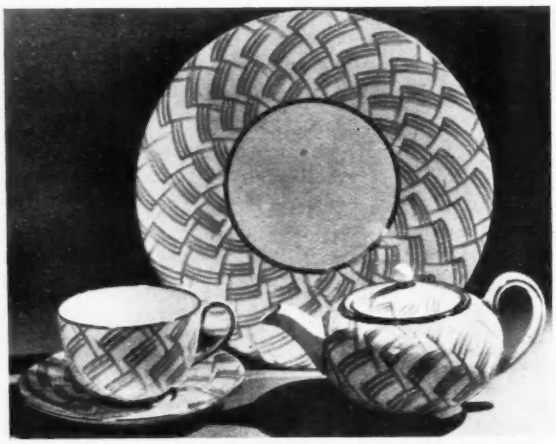
Glazes consist of mass-forming ingredients and colouring oxides. Lead oxide, potash, soda, lime, magnesia, and barytes are some of the basic substances. The pigmentary oxides include cobalt, iron, manganese, copper, cadmium, titanium, uranium, and chromium. A leadless glaze, of which borax, boracic acid, and silicate are the basis constituents, lacks the brilliance of the lead glazes and is often more vulnerable to sub-aerial erosion, but it is capable of revealing unique effects to delight the eye of the connoisseur. There is no space here to describe the artistic glazes which the ceramic chemist has made possible: majolicas, tin glazes, matt glazes, opalescents, crystallines,

Placing for biscuit oven

and the transmutation glazes—peach bloom, pigeon's blood and *rouge flambé*. It must suffice to say that in no other industry can the chemist so profitably combine art and science.

Although there are numerous methods of decorating pottery more than 80 per cent. of current production is embellished with printed patterns. They may be applied under or over the glaze. In the former case they are, of course, rendered absolutely permanent by the protective film of glass. On-glaze patterns may be attacked by acids and soda and are subject to all the wear and tear of culinary service. On the other hand, they have an almost unlimited palette of colours. The intense heat of the glost oven limits the colour range for under-glaze patterns so that they are usually more sober than those applied on-glaze which are submitted only to the milder temperature of the enamel or "hardening-on" kiln. Organic pigments are, of course, quite useless in the pottery industry since they would be destroyed at such high temperatures. It may be possible, eventually, to produce a complete range of ceramic colours suitable for under-glaze decoration, but even the present restricted palette, seen through the translucent glaze, possesses unique charm.

Ceramic blues are derived from cobalt oxide and copper



The finished product: modern diaper pattern by Josiah Wedgwood and Sons, Ltd., with green and platinum finish

oxide (turquoise); browns are obtained from the oxides of iron, chrome, and manganese, and from nickel compounds; oxides of cadmium, uranium, and titanium provide yellow, orange, and ivory; greens are produced from oxides of copper and chrome, red from iron, and black from iron oxide, chrome, and nickel compounds. Cobalt blue is perhaps the most popular pigmentary material, since so many of the traditional all-over patterns, like Willow Pattern and Italian Blue, are printed from it. Cobalt oxide provides an immense range of tints and is indestructible by ceramic fire. When combined with oxide of zinc it produces enamel blues or, with alumina, a matt blue. Yellows are usually based on the antimoniate of lead. The addition of chrome produces light greens, and an admixture of iron gives orange. Copper oxide, while a most versatile colorant, is limited in application as it does not withstand great heat such as that required in the glost furnace. With alkalies it furnishes a beautiful turquoise blue, with lead it produces a fine range of greens, and in a reducing fire it may provide the valued "*sang de bœuf*" glaze effect.

Ceramic pigments may be employed in the colouring of a body, an overlying slip, an under-glaze pattern, a glaze, or an on-glaze decoration. They will be subjected to temperatures ranging from 700° C. (enamel kiln) to 1450° C. (hard china biscuit oven). In general the under-glaze colours consist of the oxide colorants and a diluent clay substance. On-glaze colours are composed by oxides integrated with a flux. The flux must, of course, agree with the glaze. The influence of flux salts on colour is one of the most important branches of ceramic chemistry.

Gold, silver, and platinum are sometimes used in the decoration of pottery. Such metallic colorants must withstand prolonged heating in air without oxidisation. Gold is by far the most popular of these metals. Its most common use is in "banding," the application of narrow circles of gold to the wares by brushwork. Two forms of gold decoration are in common use, liquid and burnished. Liquid gold is a cheap preparation which assumes a brilliant lustre immediately on application, but is less durable than burnished gold. This latter is dull and matt until polished

with agate or bloodstone, but then develops a lasting gold lustre. Gold is used in the preparation of on-glaze pinks and maroons. Aluminium, while chemically suitable for ceramic purposes, has so far found little employment in the industry.

Minute quantities of other metals in the gold preparations would ruin the decoration through oxidation, so that the metallic gold balsam of sulphur, and gold trichloride must be chemically pure. For burnished gold the precipitated power must be mixed with a flux, such as basic bismuth nitrate, and borax. The addition of small quantities of silver produces variations from golden yellow to greenish golds. Silver by itself is seldom used. Its strong affinity for the sulphur contained in atmospheric sulphur dioxide and sulphuretted hydrogen produces the ruinous black compound silver sulphide. Where a silver lustre is necessary it is often derived from platinum which, though giving rather a steely lustre, is unaffected by exposure.

Whatever changes, technical and artistic, have been introduced in the pottery industry in recent years, the problems of the ceramic chemist remain fundamentally the same as they were in Wedgwood's day. He must produce colours which expand and contract equally with the pot itself; colours which resist the wear and tear of domestic usage and the corrosive effects of acids and oils in foodstuffs; colours (on-glaze) which fuse at a lower temperature than the underlying glaze; colours which are unaffected by natural changes of temperature and humidity and reveal a texture similar to the glaze itself. He must supply the ceramic artist with a wider range of colorants, the potter with more manageable clays and glazes, and the housewife with more durable and more hygienic pots.

Alternating Double Filtration

A New System for the Treatment of Effluents

AT a joint meeting of the Institution of Chemical Engineers and the Chemical Engineering Group of the Society of Chemical Industry, held on December 9, Dr. A. Parker, Acting Director of Water Pollution Research of the D.S.I.R., described a new process which has been developed as a result of experiments in the laboratory and on a very large scale by the Water Pollution Research Board over several years. This process, which is known as "alternating double filtration" is a new method of operation of percolating filters to bring about biological purification of sewage and trade effluents and thus to reduce their polluting effect on any stream into which the liquids may be discharged.

Experiments with Milk Effluent

Some years ago the Water Pollution Research Board were faced with the problem of devising a satisfactory method of purifying the waste washing waters from milk depots and from the manufacture of milk products. Among the methods tried for purifying these waste waters was that of treatment by single filtration according to the process ordinarily employed for domestic sewage. Satisfactory purification was obtained for a time, but the quantity of solid matter, including growths of fungi and other organisms, which formed in the top layers of the filter soon clogged the filter. In experiments in the laboratories of the Birmingham Drainage Board it was discovered that excessive accumulations of solid matter in the top layer of the filter could be removed and the filter again brought into a satisfactory condition if the filter were treated for a week or two with purified effluent from another filter. This led to experiments in which the milk effluents were passed first through one percolating filter and then through another. After the filters had been in operation for about two weeks the milk effluents were supplied to the second filter and the treated liquid from this filter was passed through the first filter. The order of the two filters in series was changed at intervals throughout the experiment. By this new alternating process the difficulties previously caused by excessive accumulation of solid matter were avoided. On the basis of these experiments a large experimental plant was installed at a cheese factory, where facilities were provided by United Dairies, Limited. This plant was operated under various conditions for three years, without any serious difficulty. The quality of the treated effluent was so good that trout were able to live in it for long periods without suffering any harm.

It was also discovered that the quantity of polluting organic matter removed for each cubic yard of filtering medium was about twice as much as that removed in the treatment of domestic sewage by the normal single process. It was decided, therefore, to carry out large-scale experiments on the same process of alternating double filtration in the treatment of domestic sewage. These experiments have now been in progress for more than three years. One of the large filters has been operated by the normal process of single filtration and two have been operated by the process of alternating double filtration, using sewage liquor from the same source. It has now been established that the quantity of sewage liquor which can be efficiently purified by alternating double filtration is twice as great per cubic yard of filtering medium as that which can be efficiently purified by single filtration. In changing over from the old process to the new it is necessary to instal additional tanks to remove solid matter from the effluent from the primary filter before this liquor is supplied to the secondary filter. It is also necessary to instal pumps to pump the settled liquid from one filter to the other. The net overall saving in capital cost and in materials of construction, however, is considerable and with sewage works of medium or large size the saving is much greater than the additional cost of pumping, and the new process has already been applied in several sewage treatment plants.

At the present time the two large experimental filters employed for the treatment of sewage liquor by alternating double filtration are efficiently treating per cubic yard of medium about three times the quantity of sewage which can be treated by single filtration. This very high rate of treatment has only been in operation for a few months. Further experience is required to determine definitely whether this high rate can be maintained continuously, particularly during the cold winter months when biological activity is lower than during warm summer months.

The Dropping Mercury Electrode

A New Bibliography

A COMPREHENSIVE bibliography of the polarised dropping mercury electrode method of chemical analysis has recently been published by the Leeds and Northrup Company. First applied by Professor J. Heyrovsky, this method of qualitative and quantitative analysis of solutions has been widely extended. Comparable to the optical spectrographic method in both sensitivity and reproducibility, it is in many cases much faster. Substances may be identified by the polarising potentials at which inflection points occur in the current/potential curve and the quantity of each substance in the solution is indicated by the magnitude of the particular displacement. References in all languages have been searched back to 1903 and foreign titles are translated into English. Nearly 800 references fill 68 pages, and are divided into two sections: the first is arranged chronologically and alphabetically according to authors; the second by applications under 19 classifications. Free copies are available from the Leeds and Northrup Co., 4934 Stenton Avenue, Philadelphia, Pa., U.S.A.

Personal Notes

MR. G. J. W. FERREY, B.Sc., F.I.C., of James Woolley, Sons and Co., Ltd., wholesale chemists, has been elected a member of the Society of Public Analysts.

MAJOR E. CADBURY has been appointed regional fuel and power controller for the S.W. region; and MR. H. CARLETON WALKER is to be deputy regional controller for Wales, with special responsibilities in North Wales.

SIR HERBERT A. WALKER has been elected chairman of W. B. Dick and Co., Ltd., oil manufacturers, in succession to Mr. C. E. Dick, whose death was reported in THE CHEMICAL AGE on November 15. Sir Herbert was formerly general manager of the Southern Railway.

MR. W. C. BULLITT, former U.S. Ambassador to Russia and France, has been elected a director of the General Aniline and Film Corporation, reports Reuter. This corporation was formerly known as the American I.G. Chemical Corporation.

SIR HAROLD HARTLEY, C.B.E., M.C., F.R.S., chairman of the Fuel Research Board and member of the Advisory Council, D.S.I.R., has been elected to a honorary fellowship at Balliol College, Oxford, where he has held a research fellowship since 1931.

MR. ROGER DUNCALFE, President of the A.B.C.M., has been appointed to succeed DR. E. F. ARMSTRONG, F.R.S., as Chairman of the Chemical Divisional Council of the British Standards Institution. Dr. Armstrong has for some time desired to be relieved of the chairmanship, particularly as he is fully occupied as chemical adviser to the Ministry of Home Security; he remains in office, however, as chairman of the Finance Committee of the Institution.

DR. MARTIN H. ITTNER, Ph.D., LL.D., has been elected to receive the Perkin Medal of the Society of Chemical Industry for 1942. The medal is awarded annually for outstanding work in applied chemistry, and the medallist is selected by a committee representing the five chemical societies in the United States. For almost 45 years Dr. Ittner has been in charge of research at the Colgate-Palmolive-Peet Co. or its predecessor companies. Among many contributions is his development of a successful commercial process for the hydrogenation of fatty oils, on which process he has been granted a number of patents. He has also made valuable contributions in the field of distillation and holds several recent patents pertaining to new processes for glycerine production. The medal will be presented on January 9, 1942, at the Chemists' Club, 52 East 41st Street, New York City.

Obituary

DR. HEINRICH KOPPERS, news of whose death at the age of 69 on September 5 has just reached us, was an outstanding figure in the coke-oven industry. The first battery of coke-ovens of his own design was built at the Mathias Stinnes colliery, and thenceforth coke-ovens to his specifications were constructed all over Germany. Meanwhile he went into partnership with Altenheim and Derry and founded the English Koppers company, which in 1902 built their first large plant of regenerative ovens at Cargo Fleet. In 1904, Koppers brought out a new regenerative type in which each oven was given its own regenerator situated beneath the oven chamber; exact methods for the control of gas and air and means for flame inspection were also introduced. Shortly afterwards, in the field of by-product recovery, he introduced the semi-direct recovery process. In 1907 he visited America and built the first by-product ovens for the U.S. Steel Corporation, which marked the foundation of the American Koppers Company.

Etablissements Kuhlmann, Matières Colorantes de St. Denis, and Société St.-Clair-du-Rhône are to hand over their dyestuffs interests to a new French company which will be under the influence of I.G. Farbenindustrie. The agreement has been approved by the Vichy Government and has been placed before the Kuhlmann shareholders.

Salammoniac in India

Revival of Native Method of Production

LARGE scale manufacture of ammonium chloride is normally carried out by one of two processes, the modified ammonia-soda process and the ammonium sulphate-sodium chloride process. J. L. Sarin, of the Government Industrial Research Laboratories, Lahore, in the August issue of *Science and Culture,* describes another method current in the Kaithal district of the Punjab. Slimy mud is taken from ponds and lakes and kneaded and moulded into bricks 8 in. by 4 in. by 1½ in. in size. These are then arranged in rows one above the other, intermittently with fuel (consisting of refuse and sweepings from the town) on the escarpment of naturally occurring clay mounds, locally known as *pazawas.* The bricks are so arranged that hot air and flames pass round the entire surface of each brick. In a single mound 200,000 bricks are thus arranged. The bricks are covered with burnt earth obtained from previous operations, and finally mud-plastered. The fuel is then fired, and after some time white incrustations of raw ammonium chloride start collecting on the inner side of the last layer of bricks exposed to air. This is scratched with a dull knife and collected, about 20 maunds (of 100 lb. each) of crude ammonium chloride being gathered during one firing, which gives an average collection of about ½ oz. of raw salt per brick fired. The raw ammonium chloride thus collected is brought to a central place where it is refined by first washing away the mud and decanting. The washings are collected and evaporated to dryness in iron pans on open fires, and the solid thus obtained is refined by sublimation in glass flasks.

Modified Refining Process

Before the last war more than 600 men were engaged in the production and collection of crude ammonium chloride by this method, and more than 16 refineries produced the sublimed product from it. The average annual production was 2500 maunds of refined salt. Later, however, the industry almost died out until the number of men engaged in the collection of the crude product was reduced to about 6 or 7, and there was only one refinery. At this stage the work of reviving the industry was taken in hand by the Government Industrial Research Laboratories, Shahdara, Punjab. The first step towards this end was to increase the amount of collection per *pazawa* of bricks fired. Next, the process of refining was considerably modified. Better tanks for leaching the raw salt with water were designed and installed. After leaching, the separation of crystals from concentrated mother liquors was carried out by centrifuging, and the method of refining was so changed as to produce crystals of ammonium chloride of a fineness and purity matching the foreign product. For carrying out the sublimation, new vessels were designed and introduced. In the old method each glass flask had to be broken every time the sublimed product was removed from it. The new type of flask had a stoneware body and was provided with a flanged iron ring round its neck. A beaker-shaped earthenware condensation vessel was inverted over this ring. As a result of these and other improvements a modern factory has been set up in the district. The number of men now engaged in the collection of raw material has increased to about 300, and about 5000 maunds of raw salt are available for refining.

The crude salammoniac collected by the potters differs widely in its percentage content of ammonium chloride. The potter, with his anxiety to increase the weight of his collection of raw salt, scratches out a considerable amount of earth along with the salt at the time of removing incrustation from the surface of the bricks. Normally, the recovery of pure ammonium chloride from this collection was about 15 to 20 per cent., but now, owing to better prices, much purer ammonium chloride (in some cases about 40 per cent. pure) is available. The price of crude ammonium chloride varies from Rs. 1/4/- a maund to Rs. 2/- a maund these days. The cost of refining, sublimation, etc., works up to Rs. 15/- per maund of refined ammonium chloride produced, but the recent improvement will reduce this by 10 to 15 per cent.

General News

From Week to Week

A new consolidating Order (S.R. & O. 1941, No. 1883) containing the lists of persons with whom trading is unlawful was published on December 11 (price 2s.) A further Order, the Trading with the Enemy (Specified Persons) (Amendment) (No. 20) Order, 1941, has been made, dated December 8. This includes the names of 160 persons controlled from or closely associated with Japan.

Retail chemists and druggists interested in establishing a chemists' war council are invited to write to L. M. Angus-Butterworth, past-chairman of the chemical section of the Manchester Literary and Philosophical Society, at Ashton New Hall, Ashton-on-Mersey, Cheshire. The aims of the Council would be to help to solve such war-time problems as the shortage of supplies and the calling up of proprietors and staffs.

By the Export of Goods (Control) (No. 42) Order, 1941 (S. R. & O. 1941 No. 1932), which came into force on December 3, licences will be required for all goods exported to British North Borneo, British Solomon Islands, Cook Islands, Fiji, French Oceania, Gilbert and Ellice Islands, Hong Kong, Nauru, Netherlands East Indies, New Caledonia, New Guinea, New Hebrides, Norfolk Island, Papua, Philippine Islands, Sarawak, Thailand, Timor, Tonga, Western Samoa.

By exposing a glass surface to hydrofluoric acid vapour a small amount of the surface is etched away and a thin, transparent film of calcium fluoride is left, according to Dr. F. H. Nicoll of the RCA Laboratories. This almost invisible film not only abolishes most reflection from the surface, but the light that otherwise would be lost in reflection is transmitted through the glass. Tests have shown that the film is very tough, withstands washing with either water or alcohol, and can be heated to a high temperature.

A second training course, arranged by the Royal Society for the Prevention of Accidents, for industrial accident prevention organisers will be held at Balliol College, Oxford, from January 2 to 13. The syllabus covers every aspect of industrial accident prevention and over twenty lecturers will take part. The course is residential and about 50 trainees, nominated by their employers, will be accommodated. The programme and syllabus may be had on request to the Society, 52 Grosvenor Gardens, London, S.W.1.

Under the terms of Board of Trade Orders (S.R. & O. 1941, Nos. 1968, 1969) dated December 8, which come into force with immediate effect, all export and transhipment licences for goods consigned to any of the following destinations have been revoked: Japan (including Karafuto), Chosen (Korea), Manchuria, Kwangtung Leased Territory, Taiwan (Formosa), Japanese Mandated Islands, Japanese Islands, China (except via the Burma Road), Macao, Portuguese Timor, Thailand, French Indo-China.

In the House of Commons last week, Mr. Ellis Smith asked the President of the Board of Trade who had been appointed Dyestuffs Controller, what remuneration would be received by him, and what allowances would be allowed him for expenses. Captain Waterhouse replied that the Dyestuffs Controller was the member for Manchester Exchange (Mr. T. H. Hewlett), who neither received nor wished to receive a salary or an expenses allowance. In reply to a further question, Captain Waterhouse stated that his position as a Member of Parliament had been cleared up.

Foreign News

Barium nitrophthalate is recommended to German paint consumers for protection of ironwork against rust. It is claimed that it gives excellent results even if used in aqueous emulsions, and the covering and dyeing power, though normally moderate, can be increased by small additions of suitable dyeing substances.

Imports into Thailand of chemical products (excluding dyestuffs) in the year ended March 1940 totalled 11,254,727 kg., against 11,403,369 kg. in 1938-39. The United Kingdom sent 2,681,411 kg. (2,754,069 kg.), Germany 1,550,693 kg. (4,059,817 kg.), and Japan 1,288,004 kg. (777,235 kg.).

Mineralogical and chemical laboratories, attached to the Mines Department, are being built in Adelaide for the South Australian Government at a cost of £A31,000.

Boric acid to the extent of 11.7 mg. per kg. has been found in North Sea mud used experimentally as a fertiliser for root crops in Germany. The boric acid content may rise to 15 mg. in mud piled up in front of dikes.

As a result of 10 months' operation during 1940, the low-temperature carbonisation plant at Rotowaro, New Zealand, treated 413,845 gal. of tar and oil, producing 923 tons of pitch, 19,384 gal. of light and heavy oils, and 184,267 gal. of creosote. Another plant at Sockburn produced 33,375 gal. of tar.

Particulars of a new sizing starch, made from the cow-pea, an Indian food plant, are given by E. Hardy in a note in the current issue of *Silk and Rayon*. Its relatively small viscosity variation over a wide range of temperatures makes it appear likely to be useful in the textile industry.

A survey of the chromite resources of Oregon, U.S.A., has been undertaken by the State Geological Department, in the hope of substituting domestic for imported supplies of this material. Of the 300,000 tons of chromite used per annum in the U.S., less than 300 tons, on the average, has been home-produced.

The Argentine Government has announced that in future permits will be required for the export of argol, asbestos, barium, beryllium, bismuth, borates, felspar, fluorite, gypsum, kaolin, magnesium, mica, molybdenum, ochres, potassium and its compounds, sodium and its compounds, titanium, vanadium, and wolfram or tungsten.

The Norsk Hydro, which is at present co-operating with the I.G. Farbenindustrie in the production of hydro-electric power and synthetic fertilisers, is to increase its capital by the issue of new shares to the nominal value of 52 million kroner. No details are available concerning the price at which the new shares are to be issued or the use to which the new capital is to be put. The company has been seriously embarrassed by the freezing of it's assets abroad.

Caustic soda is being made in increasing quantities in the Argentine. The firm of Electrochlor at Rosario has reported its 1940 output of caustic soda to be 5000 tons, while an affiliated firm, Celulosa Argentina, which makes paper from wheat straw and cane, accounted for additional output. Another concern, the Compañía Química, opened a plant for the manufacture of caustic soda and other chemicals in 1940; the total output is expected to increase considerably during 1941 as a result of these and other recent installations.

Construction of a window-glass factory in Brazil, to be operated with the aid of American technicians, is now under consideration. Hitherto, 90 per cent. of Brazil's imports of window-glass came from Belgium, Germany, and Czechoslovakia, the remainder from Japan and the U.S.A. The high cost of the U.S product resulted, however, in an almost complete Japanese monopoly of the import this year. The new factory is intended to supply the entire Brazilian requirement—about 15,000 tons yearly.

Forthcoming Events

The Dominions and Colonies Section of the **Royal Society of Arts** will meet on **December 16,** at 1.45 p.m., at John Adam Street, Adelphi, London, W.C.2, when a paper on "British Empire Drug Production" will be read by Dr. Maurice Ashby, D.I.C., A.R.C.S. Mr. Arthur Mortimer will be in the chair.

A series of meetings to discuss the improved use of fuel and power in industrial plants has been arranged jointly, at the request of the Mines Department, by the principal chemical and engineering societies of the country (no tickets required). The first of these will be held on **December 16,** at 2.30 p.m., in the College of Technology, Sackville Street, Manchester, when the discussion will be opened by Dr. F. S. Sinnatt, F.R.S., Director of Fuel Research.

Films of Polymer Resins

Importance of Temperature of Formation

WHEN a layer or a resin solution emulsion is evaporated, will it leave a dust-like residue or a film? What are the conditions of obtaining a tough film? S. Voyutski and E. Dzyadel (*Colloid J. Russ.*, 1940, *6*, 717) have recently made an interesting contribution to these problems.

Solutions of polyvinyl chloride in organic solvents give strong films on evaporation. In order to avoid using inconvenient and expensive solvents, emulsions of polyvinyl chloride in water were prepared. When they were evaporated on glass only broken crusts resulted. Variation of the nature and amount of emulsifier and plasticiser was of no avail, and progress was achieved only when mercury was substituted for glass and the temperature of drying raised. An emulsion produced by mixing, at 85° C., 100 parts of polyvinyl chloride with 40 parts of dibutyl phthalate, 10 parts of oleic acid, 10 parts of animal glue, 10 parts of triethanolamine, and 400 parts of water, when dried on mercury above 50° C., gave a film which covered only 70 per cent. of the surface of mercury. This supplied an explanation for the impossibility of producing films on glass: films attached to glass could not contract and had to crack. The total elongation at break of film left by drying polyvinyl chloride solutions is several times that of emulsions; therefore, films from solutions can be obtained on glass. A microscopic investigation showed why the total elongation (and tensile strength) of films from emulsions was lower than that of films from solutions: the latter were homogeneous, whereas the former consisted of solidified droplets. No coalescence of these droplets was visible when the film were dried at 50° C., and the films were so weak that their tensile strength could not be measured. At 75° C. many droplets were in contact, formed patches, etc., and the tensile strength was 28 kg./sq. cm. At 125° C. very many droplets coalesced, and the tensile strength rose to 62 kg./sq. cm. Films from a solution showed a tensile strength of 121 kg./sq. cm. A rubber emulsion ("Revertex") produced films stronger than those made by dissolution of Revertex in benzene and evaporation of benzene; and there was little difference between the microscopical aspects of the two films. The total elongation of both rubber films increased when the temperature of drying was higher. Evidently the resin has to be, at the temperature of film formation, liquid enough to form a continuous layer when the solvent or vehicle evaporates.

Movement of U.S. Chemical Trade

Earlier Trends Maintained

TENDENCIES noted in the movement of U.S. chemical trade have continued to follow very much the same course during the first eight months of 1941 as that recorded for the first quarter of the two years (*see* THE CHEMICAL AGE, July 5, p. 4). The increase in shipments of explosives was well maintained, the figure for January-August, 1941, being $25,500,000 as compared with $15,700,000. Essential oils likewise continued their rise, exports increasing from $2,350,000 to $4,200,000, while a similar upward trend was observable in medicinal and pharmaceutical preparations ($19,500,000 to $25,900,000). Fertilisers, however, did not maintain the high rate of increase shown at the beginning of the year, the difference between the 1940 period and the 1941 period being a mere $300,000 in a total of over $12,000,000. A similar slight increase was notable in the category of pigments, paints, and varnishes, which went up from $16,000,000 to $16,100,000; this, however, was a reversal of the decline shown in the first quarter. Exports of soap also turned a slight decrease into a slight increase. Quite a considerable falling off in value was shown in the export figures for naval stores, gums, and resins, which dropped from $9,000,000 to $7,400,000. Crude sulphur likewise fell from $8,500,000 in the first eight months of 1940 to $7,000,000 in the corresponding period for 1941. Exports of chemical specialities remained practically stationary about $26,800,000.

Import trade in chemicals and allied products likewise maintained the trend towards smaller receipts shown during the first three months of the year. Exceptions to this were evidenced by the incoming amounts of seed lac (12,500,000 lb. to 19,000,000 lb.) and shellac (23,000,000 lb. to 27,000,000 lb.). Cinchona bark rose from 1½ million lb. to 3½ million lb., and carnauba wax from 12,600,000 lb. to 16,400,000 lb. Important declines were shown in imports of pyrites, creosote oil, sodium sulphate and nitrate, potash, and tung oil. Prices for the most part, as might be expected, were higher than during the period January-August, 1940.

Swedish Developments

Extension of Copper and Alcohol Production

COPPER will probably be mined at Rackejaure, the largest unit in the Skellefte mining field, according to an announcement issued by the Swedish Government, investigations undertaken by the Boliden Mining Co. and the Swedish Geological Survey having revealed new deposits of the metal. Mining of copper at Rackejaure is considered to be uneconomic in ordinary circumstances and is regarded as a temporary measure to bring some relief to the Swedish demand for copper. It has not yet been decided whether the Government will release its share in the Rackejaure mine to the Boliden Co. or undertake operations jointly with the company.

By a mutual agreement between the Government and the Boliden Co. regarding the exploitation of certain government-owned deposits in West Bothnia, a further increase of some 3000 tons a year is looked for. Annual production of copper in Sweden is estimated at 12,500 tons. Before the war, the Boliden Co. accounted for about two-thirds of the total production; to-day, it is responsible for the whole output. Sweden's annual consumption of copper is believed to be about 45,000 tons.

A factory for the extraction of aluminium from Swedish andalusite (obtained as a by-product at the Boliden gold plant) is to be built, with State co-operation.

The Government has continued its efforts to develop a large output of sulphite alcohol. Two grants of 5,000,000 kronor each have been appropriated by the Riksdag during the budgetary years 1939-40 and 1940-41 to finance the construction of new sulphite alcohol factories or extend old ones. During the budgetary year 1941-42 another grant of 8,000,000 kr. has been appropriated for the same purpose. These new plants or extensions are expected to result in a total normal output of 23 million litres—an increase of 66 per cent. in capacity. In addition, another agreement was concluded with a firm to increase its capacity by 1,400,000 litres. If plans are realised, the total normal production of sulphite alcohol at all old and new mills will amount to 65 million litres.

Flowmeters for various chemical operations have received considerable attention in our columns recently. The latest addition to our literature on the subject is a pamphlet describing main-flow rotameters, made by the ROTAMETER MANUFACTURING CO., LTD., Vale Road, Portslade, Sussex. They are not produced from stock with standard scale ranges, but are made to suit individual needs.

A leaflet dealing with the remote indication and recording of pressure or draught has recently been issued by MESSRS. ELLIOTT BROS. (LONDON), LTD., Century Works, Lewisham, S.E.13. It is said to be particularly suitable for measuring low pressures or draught, and the type of gauge employed combines the advantages of high sensitivity, rapid action, absence of liquids, and mechanical simplicity. No gearing is employed, and the operating mechanism is entirely free from back-lash.

Weekly Prices of British Chemical Products

A STEADY inquiry has been in evidence on most sections of the general chemicals market during the past week, but on the whole values show little alteration. In regard to contract deliveries substantial quantities of most of the leading industrial products are passing into consumption and the position seems to be satisfactory. In regard to the potash section and also to a great extent in the soda products section offers are on a restricted scale with supplies earmarked for priority uses. In other directions there is no material change in the position. Acetic and oxalic acids are in active request and there is a ready market for available quantities of formaldehyde. An advance in the price of white lead, ground-in-oil quality, has been put into operation, this increase being due to the dearer price of linseed oil. In regard to the coal tar products section an active demand is reported for creosote oil, carbolic acid crystals, naphthas and xylol, whilst a hesitant atmosphere is apparent in the market for cresylic acid and crude carbolic acid pending a decision regarding the control.

MANCHESTER.—The few changes in prices on the Manchester chemical market during the past, chiefly affecting the red leads and ammonium persulphate, have been towards higher levels. Most materials, however, although undoubtedly firm have shown little actual movement. Contracts for the most part are being drawn against steadily, whilst a fair number of inquiries, some of them relating to good quantities, have been reported. Contract deliveries for most of the leading tar products are also on a good scale, though in several sections of the by-products market fresh buying is largely at a standstill owing to the uncertainties of new control measures.

GLASGOW.—The position in the Scottish heavy chemical trade remains unchanged from last week, home business keeping up its steady day-to-day transactions. Export inquiries are rather limited. Prices remain unchanged.

Price Changes

Rises: Ammonia, anhydrous; ammonium sulphate; antimony oxide; antimony sulphide; borax; boric acid; cadmium sulphide; carbon bisulphide; chlorine, liquid; glycerine; india rubber substitutes; lactic acid; lead, white; raphthalene; potassium bichromate; sodium nitrate; tartaric acid; vegetable lamp black.

Falls: Mineral black; xyiol.

General Chemicals

Acetic Acid.—Maximum prices per ton: 80% technical, 1 ton £39 10s.; 10 cwt./1 ton, £40 10s., 4/10 cwt., £41 10s.; 80% pure, 1 ton, £41 10s.; 10 cwt./1 ton, £42 10s.; 4/10 cwt., £43 10s.; commercial glacial, 1 ton, £49; 10 cwt./1 ton, £50; 4/10 cwt., £51; delivered buyers' premises in returnable barrels, £4 10s. per ton extra if packed and delivered in glass.

Acetone.—Maximum prices per ton, 50 tons and over, £65; 10/50 tons, £65 10s.; 5/10 tons, £66; 1/5 tons, £66 10s.; single drums, £67 10s.; delivered buyers' premises in returnable drums or other containers having a capacity of not less than 45 gallons each. For delivery in non-returnable containers of 40/50 gallons, the maximum prices are £3 per ton higher. Deliveries of less than 10 gallons free from price control.

Alum.—Loose lump, £10 10s. per ton, d/d, nominal.

Aluminium Sulphate.—£10 15s. per ton d/d.

Ammonia Anhydrous.—1s. 9d. to 2s. 3d. per lb.

Ammonium Carbonate.—£32 to £39 per ton d/d in 5 cwt. casks.

Ammonium Chloride.—Grey galvanising, £22 10s. per ton, in casks, ex wharf. Fine white 98%, £19 10s. per ton. See also Salammoniac.

Antimony Oxide.—£95 to £110 per ton.

Arsenic.—99/100%, £36 per ton, ex store.

Barium Chloride.—98/100%, prime white crystals, £11 10s. to £13 per ton, bag packing, ex works; imported material would be dearer.

Bleaching Powder.—Spot, 35/37%, £11 per ton in casks, special terms for contract.

Borax, Commercial.—Granulated, £31 10s.; crystals, £32 10s.; powdered, £33; extra fine powder, £34; B.P. crystals, £40 10s.; powdered, £41; extra fine, £42 per ton for ton lots, in free 1-cwt. bags, carriage paid in Great Britain. Borax Glass, lump, £83; powder, £84 per ton in tin-lined cases for home trade only, packages free, carriage paid.

Boric Acid.—Commercial, granulated, £52 15s.; crystals, £53 15s.; powdered, £54 15s.; extra fine powder, £56 15s.; B.P. crystals, £61 15s.; powdered, £62 15s.; extra fine powdered, £64 15s. per ton for ton lots in free 1-cwt. bags, carriage paid in Great Britain.

Calcium Bisulphite.—£6 10s. to £7 10s. per ton f.o.r. London.

Calcium Chloride.—70/72% solid, £5 15s. per ton ex store.

Charcoal Lump.—£10 10s. to £14 per ton, ex wharf. Granulated, supplies scarce.

Chlorine, Liquid.—£22 7s. 6d. per ton, d/d in 16/17 cwt. drums (3-drum lots); 5½d. per lb. d/d station in single 70-lb. cylinders.

Chrometan.—Crystals, 5½d. per lb.; liquor, £24 10s. per ton d/d station in drums.

Chromic Acid.—1s. 2d. per lb., less 2½%; d/d U.K. GLASGOW: 1s. 0½d. per lb. for 1 cwt. lots.

Citric Acid.—1s. 5½d. per lb. MANCHESTER: 1s. 6d.

Copper Oxide.—Black, £95 per ton.

Copper Sulphate.—About £29 10s. per ton f.o.b. MANCHESTER: £29 10s., less 2%, in 5 cwt. casks f.o.b. Liverpool.

Cream of Tartar.—100%, £13 2s. per cwt., less 2½%, d/d in sellers' returnable casks.

Formaldehyde.—£21 15s. to £25 per ton d/d. MANCHESTER: 40%, £22 to £25 per ton in casks d/d; imported material dearer.

Formic Acid.—85%, £47 per ton for ton lots, carriage paid; smaller parcels quoted up to 50s. per cwt., ex store.

Glycerine.—Chemically pure, double distilled 1260 s.g., in tins, £3 15s. to £4 15s. per cwt., according to quantity; in drums, £3 9s. 6d. to £4 1s. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

Hexamine.—Technical grade for commercial purposes, about 1s. 4d. per lb.; free-running crystals are quoted at 2s. 1d. to 2s. 3d. per lb.; carriage paid for bulk lots.

Hydrochloric Acid.—Spot, 6s. 3½d. to 8s. 9½d. carboy d/d, according to purity, strength and locality.

Hydrofluoric Acid.—59/60%, about 6d. per lb.

Iodine.—Resublimed B.P., 9s. 11d. to 13s. 11d. per lb., according to quantity.

Lactic Acid.—Dark tech., 50% by vol., £40 10s. per ton. Not less than one ton lots ex works; barrels returnable, carriage paid.

Lead Acetate.—White, £48 to £52 ton lots. MANCHESTER: £48 to £50 per ton.

Lead Nitrate.—About £46 10s. per ton d/d in casks.

Lead, Red.—English, 5/10 cwt., £43 10s.; 1 cwt. to 1 ton, £43 5s.; 1/2 tons, £43; 2/5 tons, £42 10s.; 5/20 tons, £42; 20/100 tons, £41 10s.; over 100 tons, £41 per ton, less 2½ per cent., carriage paid; non-setting red lead 10s. per ton dearer in each case.

Lead, White.—Dry English, less than 5 tons, £55; 5/15 tons, £51; 15/25 tons, £50 10s.; 25/50 tons, £50; 50/200 tons, £49 10s. per ton, less 5 per cent., carriage paid; Continental material, £1 per ton cheaper. Ground in oil, English, 1/5 cwt., £65 10s.; 5/10 cwt., £64 10s.; 10 cwt. to 1 ton, £64; 1/2 tons, £62 10s.; 2/5 tons, £61 10s.; 5/10 tons, £59 10s.; 10/15 tons, £58 10s.; 15/25 tons, £58; 25/50 tons, £57 10s.; 50/100 tons, £57 per ton, less 5 per cent., carriage paid.

Litharge.—1 to 2 tons, £43 per ton.

Lithium Carbonate.—7s. 9d. per lb. net.

Magnesite.—Calcined, in bags, ex works, £18 15s. to £22 15s. per ton.

Magnesium Chloride.—Solid (ex wharf), £12 to £13 per ton. MANCHESTER: £13 to £14 per ton.

Magnesium Sulphate.—Commercial, £10 to £12 per ton, according to quality, ex works.

Mercury Products.—Controlled price for 1 cwt. quantities: Bichloride powder, 11s. 7d.; bichloride lump, 12s. 2d.; ammon. chloride powder, 13s. 5d.; ammon. chloride lump, 14s.; mercurous chloride, 13s. 9d.; mercury oxide, red cryst., B.P., 15s.; red levig. B.P., 15s. 6d.; yellow levig. B.P., 14s. 9d.; yellow red, 14s. 4d.; sulphide, red, 12s. 11d.

Methylated Spirit.—Industrial 66° O.P. 100 gals., 2s. 4d. per gal.; pyridinised 64° O.P. 100 gals., 2s. 5d. per gal.

Nitric Acid.—£23 to £31 per ton ex works.

Oxalic Acid.—£60 to £65 per ton for ton lots, carriage paid, in 5-cwt. casks; smaller parcels would be dearer; deliveries slow.

Paraffin Wax.—Nominal.

Potash, Caustic.—Basic price for 50-100 ton lots. Solid, 88/92%, commercial grade, £53 15s. per ton, c.i.f. U.K. port, duty paid. Broken, £5 extra; flake, £7 10s. extra; powder, £10 extra per ton. Ex store, £3 10s. supplement.

Potassium Bichromate.—Crystals and granular, 7½d. per lb.; ground, 8½d. per lb., for not less than 6 cwt.; 1-cwt. lots, ½d. per lb. extra.

Potassium Carbonate.—Basic prices for 50 to 100 ton lots: calcined, 98/100%, £58 per ton, c.i.f. U.K. port. Ex warehouse, £3 10s. extra per ton.

Potassium Chlorate.—Imported powder and crystals, ex store London, 2s. per lb., nominal.

Potassium Iodide.—B.P., 8s. 8d., to 12s. per lb., according to quantity.

Potassium Nitrate.—Small granular crystals, £40 to £45 per ton ex store, according to quantity.

Potassium Permanganate.—B.P., 1s. 8½d. per lb. for 1 cwt. lots; for 3 cwt. and upwards 1s. 8d. per lb.; technical, £7 15s. 3d. to £8 9s. 6d. per cwt., according to quantity d/d.

Potassium Prussiate.—Supplies scarce, prices nominal.

Salammoniac.—First lump, spot, £48 per ton; dog-tooth crystals, £50 per ton; medium, £48 10s. per ton; fine white crystals, £19 10s. per ton, in casks, ex store.

Soda, Caustic.—Solid 76/77%; spot, £15 7s. 6d. per ton d/d station.

Sodium Acetate.—£40 per ton, ex wharf.

Sodium Bicarbonate (refined).—Spot, £11 per ton, in bags.

Sodium Bichromate.—Crystals, cake and powder, 5½d. per lb., anhydrous, 6d. per lb., net d/d U.K.

Sodium Bisulphite Powder.—60/62%, £18 15s. per ton d/d in 2-ton lots for home trade.

Sodium Carbonate Monohydrate.—£21 per ton d/d in minimum ton lots in 2 cwt. free bags.

Sodium Chlorate.—£36 to £45 per ton, d/d, according to quantity.

Sodium Hyposulphite.—Pea crystals, £19 15s. per ton for 2-ton lots; commercial £14 15s. per ton. MANCHESTER: Commercial, £14 10s.; photographic, £19 15s.

Sodium Iodide.—B.P., for not less than 28 lb., 9s. 6d. per lb.; for not less than 7 lb., 13s. 1d. per lb.

Sodium Metasilicate.—£15 15s. per ton, d/d U.K. in cwt. bags.

Sodium Nitrate.—Refined, £14 10s. to £15 5s. per ton for 6-ton lots d/d.

Sodium Nitrite.—£24 10s. per ton for ton lots.

Sodium Perborate.—10%, £5 2s. per cwt.

Sodium Phosphate.—Di-sodium, £20-£25 per ton d/d for ton lots. Tri-sodium, £25-£28 per ton d/d for ton lots.

Sodium Prussiate.—From 7½d. per lb. ex store.

Sodium Silicate.—£9 15s. per ton, for 4-ton lots.

Sodium Sulphate (Glauber Salts).—£4 10s. ton d/d.

Sodium Sulphate (Salt Cake).—Unground. Spot £4 8s. 6d. per ton d/d station in bulk. MANCHESTER: £4 13s. 6d. per ton d/d station.

Sodium Sulphide.—Solid 60/62%. Spot, £17 15s. per ton d/d in drums; crystals, 30/32%, £11 15s. per ton d/d in casks.

Sodium Sulphite.—Anhydrous, £29 10s. per ton; Pea crystals, spot, £19 10s. per ton d/d station in kegs; commercial, £13 15s. per ton d/d stations in bags.

Sulphur.—Finely powdered, £19 per ton d/d; precip. B.P., 68s. per cwt.

Sulphuric Acid.—168° Tw., £6 10s. to £7 10s. per ton; 140° Tw., arsenic-free, £4 11s. per ton; 140° Tw., arsenious, £4 3s. 6d. per ton. Quotations naked at sellers' works.

Tartaric Acid.—4s. 0½d. per lb., less 5%, carriage paid for lots of 5 cwt. and upwards. MANCHESTER: 4s. per lb.

Tin Oxide.—Snow white, £278 per ton.

Zinc Oxide.—Maximum prices: White seal, £30 17s. 6d. per ton; red seal, £28 7s. 6d. d/d; green seal, £29 17s. 6d. d/d.

Zinc Sulphate.—Tech., £20-£21 per ton, carriage paid, casks free.

Rubber Chemicals

Antimony Sulphide.—Golden, 1s. 2d. to 2s. per lb. Crimson, 2s. 6d. to 2s. 7d. per lb.

Arsenic Sulphide.—Yellow, 1s. 10d. to 2s. per lb.

Barytes.—Best white bleached, £8 3s. 6d. per ton.

Cadmium Sulphide.—5s. 9d. to 6s. 6d. per lb.

Carbon Black.—5½d. to 8d. per lb., according to packing.

Carbon Bisulphide.—£35 5s. to £40 5s. per ton, according to quantity, in free returnable drums.

Carbon Tetrachloride.—£46 to £49 per ton.

Chromium Oxide.—Green, 1s. 6d. per lb.

India-rubber Substitutes.—White, 6 1/16d. to 9½d. per lb.; dark, 5 9/16d. to 6 3/16d. per lb.

Lithopone.—30%, £25 per ton; 60%, £31 to £32 per ton. Imported material would be dearer.

Mineral Black.—£7 10s. to £10 per ton.

Mineral Rubber, "Rupron."—£20 per ton.

Sulphur Chloride.—7d. per lb.

Vegetable Lamp Black.—£49 per ton.

Vermilion.—Pale or deep, 13s. per lb., for 30-lb. lots.

Plus 5% War Charge.

Nitrogen Fertilisers

Ammonium Phosphate Fertilisers.—Type B, £13 18s. 9d. per ton in 6-ton lots, d/d farmer's nearest station in December.

Ammonium Sulphate.—Per ton in 6-ton lots, d/d farmer's nearest station; December, £9 17s. 6d.; January, £9 19s.; February, £10 0s. 6d.; March/June, 1942, £10 2s. Rebate per ton on future deliveries, December, 2s.

Calcium Cyanamide.—Nominal; supplies very scanty.

Concentrated Complete Fertilisers.—£14 8s. 9d. per ton in 6-ton lots d/d farmer's nearest station in December. Supplies small except C.C.F. Special.

"Nitro Chalk."—£9 14s. per ton in 6-ton lots, d/d farmer's nearest station in December.

Sodium Nitrate.—Chilean super-refined for 6-ton lots d/d nearest station, £15 5s. per ton; granulated, over 98%, £14 10s. per ton. Surcharges for smaller quantities unless collected at warehouse or depots.

Coal Tar Products

Benzol.—Industrial (containing less than 2% of toluol), 2s. to 2s. 2d. per gal., ex works.

Carbolic Acid.—Crystals, 9½d. to 10¾d. per lb.; Crude, 60's 3s. 3d. to 4s. 6d., according to specification. MANCHESTER: Crystals, 9½d. to 10¾d. per lb., d/d; crude, 4s. to 4s. 6d., naked, at works.

Creosote.—Home trade, 6½d. to 9d. per gal., f.o.r., maker's works; exports 6d. to 6½d. per gal., according to grade. MANCHESTER: 6½d. to 9d. per gal.

Cresylic Acid.—Pale, 99/100%, 4s. 9d. per gal. MANCHESTER: Pale, 99/100%, 4s. 10d. per gal.

Naphtha.—Solvent, 90/160°, 2s. 6d. to 2s. 10d. per gal.; Heavy 90/190°, 1s. 10½d., naked at works. MANCHESTER: 90/160°, 2s. 6d. to 2s. 10d.

Naphthalene.—Crude, whizzed or hot pressed, £11 3s. to £11 8s. per ton; purified crystals, £19 to £36 per ton in 2-cwt. bags; flaked, £28 to £35 per ton. Fire-lighter quality, £7 10s. to £9 10s. per ton ex works. MANCHESTER: Refined, £19 to £38 per ton.

Pitch.—Medium, soft, nominal, f.o.b. MANCHESTER: Nominal.

Pyridine.—90/140°, 18s. per gal.; 90/160°, 14s.; MANCHESTER: 14s. to 18s. 6d. per gal.

Toluol.—Pure, 2s. 5d. nominal; 90's 1s. 10d. per gal. MANCHESTER: Pure, 2s. 5d. per gal. naked.

Xylol.—Commercial, 3s. 6d. per gal.; pure, 3s. 8d. MANCHESTER: 3s. 4d. to 3s. 9d. per gal.

Wood Distillation Products

Calcium Acetate.—Brown, £21 per ton; grey, £24. MANCHESTER: Grey, £25.

Methyl Acetone.—40.50%, £54 per ton.

Wood Creosote.—Unrefined, 2s. per gal., according to boiling range.

Wood Naphtha, Miscible.—4s. 6d. to 5s. per gal.; solvent, 5s. per gal.

Wood Tar.—£4 to £5 per ton, according to quality.

Intermediates and Dyes (Prices Nominal)

m-**Cresol** 98/100%.—Nominal.

o-**Cresol** 30/31° C.—Nominal.

p-**Cresol** 34/35° C.—Nominal.

Dichloraniline.—2s. 8½d. per lb.

Dinitrobenzene.—8½d. per lb.

Dinitrotoluene.—48/50° C., 9½d. per lb.; 66/68° C., 1s.

p-**Nitraniline.**—2s. 5d. per lb.

Nitrobenzene.—Spot, 5½d. per lb., in 90-gal. drums, drums extra, 1-ton lots d/d buyer's works.

Nitronaphthalene.—1s. 2d. per lb.; P.G., 1s. 0½d. per lb.

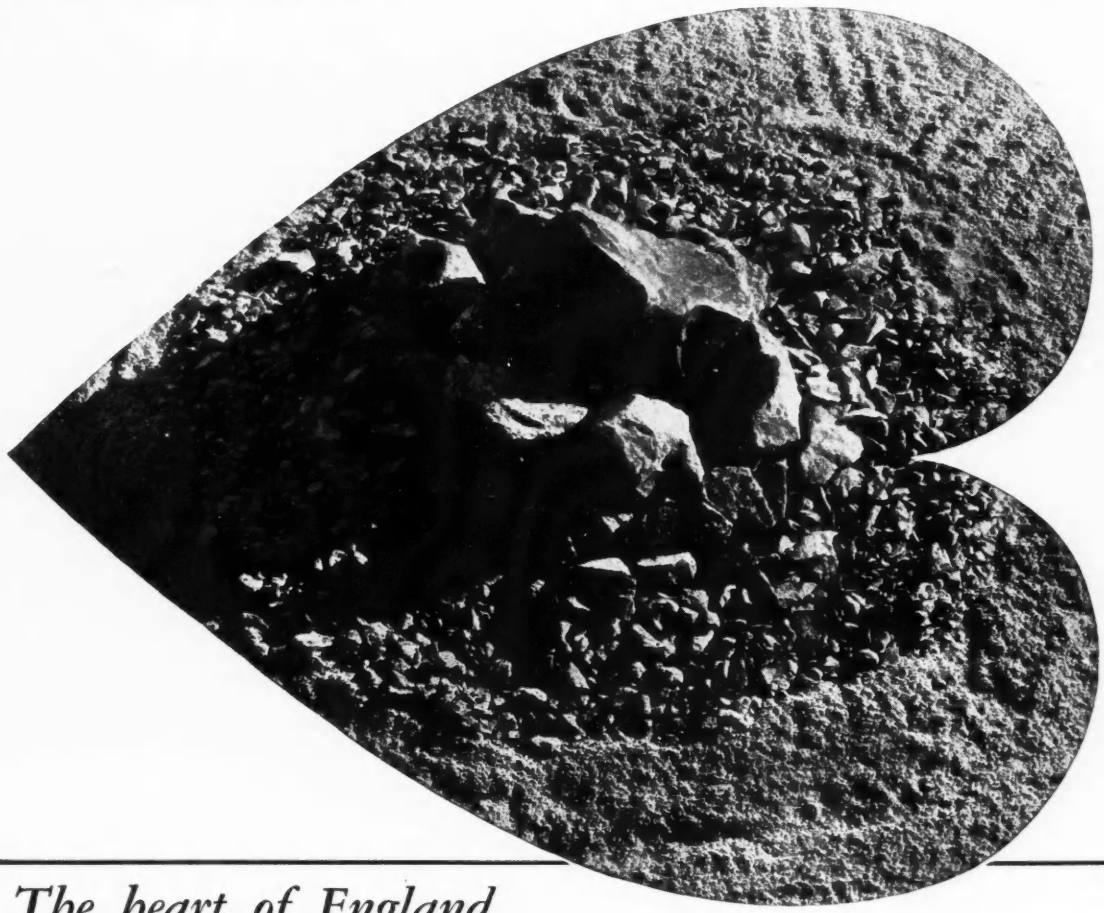
o-**Toluidine.**—1s. per lb., in 8/10 cwt. drums, drums extra.

p-**Toluidine.**—2s. 2d. per lb., in casks.

m-**Xylidine Acetate.**—4s. 5d. per lb., 100%.

Latest Oil Prices

LONDON.—DECEMBER 10.—For the period ending December 27, per ton, net, naked, ex mill, works or refinery, and subject to additional charges according to package and location of supplies:—LINSEED OIL, raw, £41 10s. RAPESEED OIL, crude, £44 5s. COTTONSEED OIL, crude, £31 2s. 6d.; washed, £34 5s.; refined edible, £35 12s. 6d.; refined deodorised, £36 10s. SOYA BEAN OIL, crude, £33; refined deodorised, £37. COCONUT OIL, crude, £28 2s. 6d.; refined deodorised, £31 7s. 6d. PALM KERNEL OIL, crude, £27 10s.; refined deodorised, £30 15s. PALM OIL, refined deodorised, £37; refined hardened deodorised, £41. GROUNDNUT OIL, crude, £35 10s.; refined deodorised, £40. WHALE OIL, crude hardened, 42 deg., £30 10s.; refined hardened, 42 deg., £33. ACID OILS.—Groundnut, £19; soya, £17; coconut and palm kernel, £22 10s. ROSIN, 26s. 6d. to 33s. per cwt., ex wharf, according to grade. TURPENTINE, American, 90s. per cwt., in drums or barrels, as imported (controlled price).



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Company News

British Tar Products, Ltd., announce a final dividend of 6 per cent., making 10 per cent. for the year (same).

The Metal Box Co., Ltd., have declared an interim dividend of 5 per cent. (same).

Midland Tar Distillers, Ltd., have declared an interim dividend of 3 per cent., tax free, on the preference capital. Last year's dividends made a total of 5 per cent. for the year.

Manbre and Garton, Ltd., announce net trading profit for the year, ended September 30, of £514,946 (£525,900). Dividend payments were given in this column on November 22.

The Imperial Smelting Corporation, Ltd., reports a trading profit from its subsidiary companies for the year, ended June 30, of £463,814 (£393,921), while the total receipts for the parent company are shown as £298,842 (£280,640).

Explosives and Chemical Products, Ltd., announce net profit to June 30, of £13,283 (£15,517), and have declared a dividend on ordinary shares of 16⅔ per cent. (same), while on preferred shares they are paying a dividend of 7.7239d. (7.6649d.) per share.

British Benzol and Coal Distillation, Ltd., announce trading profit for the year, ended October 31, of £99,280 (£85,629). After deduction for depreciation, income tax and E.P.T., the net profit is £23,017 (£13,161). Dividend payments were announced in this column last week.

New Companies Registered

John Swain (Seed and Soil Dressings), Ltd. (371,063).—Private company. Capital: £1000 in 1000 shares of £1 each. Manufacturers of and dealers in liquid and dry seed and soil dressings, chemical and other manures, insecticides, fungicides, spraying machines, etc. Directors: C. Hansford, 7 Royal Crescent, Bath; and F. D. Webber.

Emmet Distributing Company, Ltd. (371,083).—Private company. Capital: £5000 in 3000 "A" and 2000 "B" shares of £1 each. Manufacturers of and wholesale and retail dealers in chemicals, disinfectants, dyes, pigments, plastics, oils, greases, etc. Subscribers: Geo. H. Byfield, Lillie Rose. Registered office: 7 Park Lane, W.1.

Rosedale Plastic Industries, Ltd. (370,978).—Private company. Capital: £2000 in 2000 shares of £1 each. Manufacturers, importers and exporters of and dealers in raw materials, manufactured articles and goods capable of being used in the trades of moulders, metal workers, paper makers, glassmakers, dyers, chemists, etc. Subscribers: F. J. Fish, Mary E. Davies, Norman Rosedale, of Treforest Trading Estate, Glam., is the first director.

Chemical and Allied Stocks and Shares

FOLLOWING the extension of the war to the Far East there has been a marked decline of Stock Exchange business, and security values have been reactionary. On Monday, prices were marked down sharply, but this was largely a precautionary measure, and the general tendency has become fairly steady, sentiment having benefited from the absence of any heavy selling pressure. In fact, general willingness to take a long view again indicated confidence in the future, and at the time of writing the rather lower prices have tended to attract buyers, although the volume of business has remained at a much reduced level. A firm undertone was maintained in British Funds and leading investment securities, which were only slightly lower on balance.

Shares of companies playing a vital part in the war effort were not immune from the surrounding market tendency, but with few exceptions they showed only moderate declines, including the securities of leading chemical and kindred companies. Imperial Chemical were 32s. 6d. compared with 33s. 6d. a week ago, while the 7 per cent. preference shares were moderately lower at 34s. 3d. B. Laporte remained at 63s. 9d.; and Fison Packard were amount 36s., having continued to be firmly held in advance of the dividend announcement. Greeff-Chemicals 5s. units were quoted at 5s. 7½d. "middle" and have changed hands at 5s. 10½d., while elsewhere, British Drug Houses transferred at 25s. at one time. Rather more attention continued to be given to Morgan Crucible preference issues; dealings at 24s. 6d. were recorded in the 5½ per cent. first preference. Aided by satisfaction with the slightly higher payment, Imperial Smelting have remained at 12s. 6d., although now quoted "ex" the dividend. Moreover, in other directions, demand continued for British Aluminium, which at the time of writing have further improved to 46s. compared with 45s. 4½d. a week ago. Various shares which recently showed strong advances were reactionary, but most declines were moderate in character. Triplex Glass went back a few pence to 32s. United Molasses declined from 31s. 6d. to 30s. 6d. and the units of the Distillers Co. were marked down from 74s. 6d. to 73s. 9d. Pending the dividend announcement, Turner and Newall remained firmly held, but were quoted at 73s. 6d., compared with 75s. 7½d. a week ago.

Lever and Unilever were slightly lower at 28s., but British Oil and Cake preferred were unchanged at 41s. 9d. Moreover, Borax Consolidated deferred had a relatively steady appearance at 30s. 3d.; as in many other directions, however, quotations have not been tested by much business at the time of writing. Barry and Staines continued to be reactionary, and were 35s., but Nairn and Greenwich have remained at 61s. 3d. at the time of writing; financial results of the last-named company are due in a few weeks. There was a little profit-taking in various shares of companies associated with plastics, including Catalin ordinary; but Erinoid 5s. ordinary remained around 7s. and Lacrinoid Products 2s. shares transferred around 2s. 7½d. Moreover, pending the financial results, British Industrial Plastics 2s. ordinary were little changed at 3s. 6d. Thomas De La Rue were dealt in around 50s. 6d.

Following their recent strong rise, British Plaster Board 5s. shares have shown a decline from 20s. to 18s. 6d. Associated Cement moved back to 50s. and Murex were 92s. 6d. compared with 93s. 9d. a week ago. At the time of writing, Boots Drug have maintained a steady appearance at 37s. 6d., and Beechams Pills deferred were slightly lower at 10s. 7½d. Allied Ironfounders were 22s 6d. xd British Match were steady at 35s. 6d., but Wall Paper Manufacturers deferred units further declined to 25s. 6d. Tube Investments, at 87s. 1½d., were steady on publication of the full report, which points out that the works turned out an increased production, but heavier manufacturing costs, taxation, etc., made for lower net profits. Oil shares declined heavily, particularly Burmah Oil, and shares of companies with interests in the new war area. Exceptionally, Trinidad Leaseholds rallied to 66s. 3d.